



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/580,890	05/25/2006	Sun Yang Kook	LPP20081318US	7135
66390	7590	02/16/2011	EXAMINER	
LEXYOUUME IP GROUP, PLLC				ENIN-OKUT, EDUE
5180 PARKSTONE DRIVE, SUITE 175		ART UNIT		PAPER NUMBER
CHANTILLY, VA 20151		1727		
		MAIL DATE		DELIVERY MODE
		02/16/2011		PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/580,890	YANG KOOK ET AL.
	Examiner Edu E. Enin-Okut	Art Unit 1727

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If no period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 25 August 2010.
 2a) This action is FINAL. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 16-29 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 16-29 is/are rejected.
 7) Claim(s) _____ is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
 2) Notice of Draftsman's Patent Drawing Review (PTO-210)
 3) Information Disclosure Statement(s) (PTO/SB/08)
 Paper No(s)/Mail Date _____
- 4) Interview Summary (PTO-413)
 Paper No(s)/Mail Date _____
- 5) Notice of Informal Patent Application
 6) Other: _____

**CATHODE ACTIVE MATERIAL FOR LITHIUM SECONDARY BATTERY,
PROCESS FOR PREPARING THE SAME
AND REACTOR FOR USE IN THE SAME PROCESS**

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 25, 2010 has been entered. Applicant has cancelled claims 1-15 and added claims 16-29. Claims 16-29 are pending.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Information Disclosure Statement

3. As discussed in the previous Office Action and re-iterated here, the listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Claim Objections

4. The objection to claim 1 is withdrawn because claim 1 was cancelled.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 20, claim 20 recites limitations with respect to the oxidation states of nickel, manganese and cobalt in the lithium metal composite oxide. However, as recited in its parent claim 1, these components may not be present in the lithium metal composite oxide.

Claim Rejections - 35 USC § 103

7. The rejection of claims 1 and 2 under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. (US 2003/0170540) is withdrawn because claims 1 and 2 were cancelled.

8. The rejection of claims 3, 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. as applied to claims 1 and 2 above, and further in view of Tanigawa et al. (US 2002/0164527), is withdrawn because claims 3, 4 and 5 were cancelled.

9. The rejection of claim 6 under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. in view of Tanigawa et al. as applied to claims 1-5 above, and further in view of Sun et al. (US 6,071,489), is withdrawn because claim 6 was cancelled.

10. Claims 16, 17, 19, 20, 22, 26, 27, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. (US 2003/0170540). Additional supporting evidence provided by the Collins English Dictionary and the Chambers 21st Century Dictionary.

Regarding claims 16, 17, 19, 26 and 27, Ohzuku et al. teaches a process for preparing a positive electrode active material for a lithium secondary battery using a positive electrode active material of $\text{LiNi}_{1/3}\text{Mn}_{1/3}\text{Co}_{1/3}\text{O}_2$ (para. 138,211,212; Table 5), which meets Applicant's formula $\text{Li}_{1-\delta}[\text{Ni}_x\text{Mn}_{x-y}\text{Co}_{1-2(x+y)}\text{M}_y]\text{O}_{2-\alpha}\text{P}_\alpha$ ($\delta=0$, $x=1/3$, $y=0$, $z=0$, and $\alpha=0$). The positive active material is composed of a mixture of crystalline particles of the lithium-containing oxide having a particle size of 0.1-2 μm ("first lithium metal composite oxide") and a secondary particle of the lithium-containing oxide ("second lithium metal composite oxide") having a particle size of 2-20 μm (para. 31; Claim 9).

The process of preparing the particles ("first lithium metal composite oxide" and "second lithium metal composite oxide") is composed of the steps of: simultaneously, adding nickel sulfate, manganese sulfate and cobalt sulfate ("metal precursors"), an aqueous ammonia solution and a NaOH basic solution to a reaction bath (6) of the apparatus ("reactor") and mixing and precipitating them to obtain a nickel manganese cobalt composite hydroxide as a precursor, wherein the apparatus ("reactor") has a structure in which an agitator with vanes ("rotary vanes"), which agitate, thus direct the liquid and baffles directing the aqueous solution out of the apparatus ("reactor") opening are spaced apart from the inner wall of the apparatus ("reactor"); and mixing and reacting the nickel manganese cobalt composite hydroxide with lithium hydroxide ("lithium precursor") to obtain $\text{LiNi}_{1/3}\text{Mn}_{1/3}\text{Co}_{1/3}\text{O}_2$ ("lithium metal composite oxide") (Figs. 1,4; para. 1,85-88,96-103,138,211,212; Table 5; see labeled figures below).

As to the first lithium composite oxide having a mean particle diameter less than 90% than that of the second lithium metal composite oxide, Ohzuku teaches positive active material

is composed of a mixture of crystalline particles of the lithium-containing oxide having a particle size of 0.1-2 μm ("first lithium metal composite oxide") and a secondary particle of the lithium-containing oxide ("second lithium metal composite oxide") having a particle size of 2-20 μm , more likely 10-20 μm (para. 31,97; Claim 9). It has been held that obviousness exists where the claimed ranges overlap or lie inside ranges disclosed by the prior art. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). See MPEP 2144.05 (I). It has been held that, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). See MPEP 2144.05 (II).

Regarding claim 20, Ohzuku teaches a positive electrode active material of $\text{LiNi}_{1/3}\text{Mn}_{1/3}\text{Co}_{1/3}\text{O}_2$ (para. 138,211,212; Table 5), which meets Applicant's formula $\text{Li}_{1+\delta}[\text{Ni}_x\text{Mn}_{x+y}\text{Co}_{1-2(x+y)}\text{M}_y]\text{O}_{2-a}\text{P}_a$ ($\delta=0$, $x=1/3$, $y=0$, $z=0$, and $a=0$), as discussed above. As to the oxidation value of nickel, manganese and cobalt, applicant states in paragraph 121 of the instant specification that the cathode active materials described on in Examples 1-11 have nickel, manganese and cobalt oxidation values as recited in the claim. Thus, these oxidation values are found to be an inherent characteristic of the composite cathode material comprising all the claimed elements. Since the prior art does discloses a composite cathode material comprising substantially the same elements or components as that of the applicant, it is contended that the active material of the prior art has similar oxidation values.

Accordingly, products of identical chemical composition can not have mutually exclusive properties, and thus, the claimed property (i.e. the specific output energy density), is necessarily present in the prior art material. The courts have held that "[p]roducts of identical chemical composition can not have mutually exclusive properties." A chemical composition and its

properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See MPEP 2112.

Regarding claim 22, Ohzuku et al. teaches the aqueous solution containing nickel sulfate, manganese sulfate and cobalt sulfate, which is three metal salts being used as the metal precursor (para. 211-212).

Regarding claim 29, Ohzuku does not expressly teach the rotary vanes being the reverse vane type; or, that the baffles have a shape of a flat panel and are connected to the inner wall via connecting rods.

As to the baffles having a flat panel shape, the Collins English Dictionary evidences that a vane is any flat or shaped plate used to direct fluid flow (vane entry) (Collins English Dictionary, 2000, [online]; see <http://www.credoreference.com/entry/hcengdict/vane>). Further, the Chambers 21st Century Dictionary evidences that a baffle is a device for controlling the flow of liquid through an opening (baffle entry) (Chambers 21st Century Dictionary 2001, [online]; www.credoreference.com/entry/chambdict/baffle).

As to the baffles being connected to the inner wall via connecting rods, it should be noted that the courts have been held that, to be entitled to weight in method claims, the recited structure limitations therein must affect the method in a manipulative sense, and not to amount to the mere claiming of a use of a particular structure. *Ex parte Pfeiffer*, 135 USPQ 31 (BPAI 1961). Further, it would have been obvious to one having ordinary skill in the art at the time the invention was made to attach the baffles to the inner walls of the reactor, since it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse*, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950). See MPEP 2144.04 (VI).

Ohzuku et al. also teaches that there are two experimental apparatus' ("reactors") the one shown in figure 4 and the one shown in figure 1; the agitator (3) with vanes ("rotary vanes") of figure 1 causes the flow to be downward; while the agitator with vanes ("rotary vanes") of figure 4 causes the flow to be upward (Figs. 1,4; para. 85-88,96-103). Thus, one of these agitators with vanes ("rotary vanes") is in reverse from the other.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize either experimental apparatus ("reactors"), one having a reverse type agitators with vanes ("rotary vanes") from the other, because Ohzuku et al. discloses that both of these are used to produce positive active materials by the coprecipitation method (Figs. 1,4; para. 85-88,96-103; see labeled figures below).

Labeled figures from Ohzuku:

FIG. 1 (annotated)

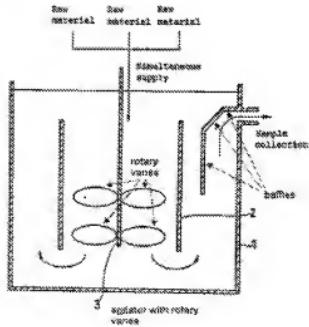
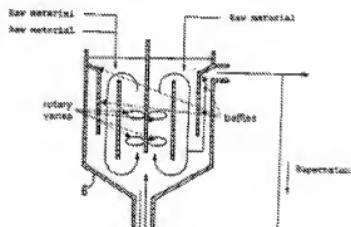


FIG. 4 (annotated)



11. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. (US 2003/0170540) as applied to claims 16, 17, 19, 20, 22, 26, 27, and 29 above, and further in view of Watanabe et al. (JP 09-129230 A; refer to JPO Abstract and machine translation).

Ohzuku is applied and incorporated herein for the reason above.

Regarding claim 18, Ohzuku does not expressly teach that the cathode active material includes about 5-40 wt % of the first lithium metal composite oxide.

Watanabe teaches a $\text{LiN}_x\text{M}_{1-x}\text{O}_2$ positive active material used in a nonaqueous electrolyte secondary battery (M is any one or more of Co, Mn, Cr, Fe, V, and Al; and, $1 > x \geq 0.5$) (Abstract; machine translation, para. 16,32). The positive active material is composed of mixture of particles with sizes of $0.1\text{-}2 \mu\text{m}$ and $2\text{-}20 \mu\text{m}$ where the $0.1\text{-}2 \mu\text{m}$ particles compose 5-50 wt % of the mixture (machine translation, claims 1, 2, para. 17).

It would have been obvious to one of ordinary skill in the art at the time of the invention to include from 5-40 wt % of the first lithium composite oxide in the cathode composite active material made using the method of Ohzuku because Watanabe teaches that controlling the size of the mixture of particles in a positive active material can assist in improving the capacity, cycle and charging characteristic of a battery using that material (see Watanabe, machine translation, para. 15,21); and, it has been held that obviousness exists where the claimed ranges overlap or lie inside ranges disclosed by the prior art. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). See MPEP 2144.05 (I).

12. Claims 21 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. (US 2003/0170540) as applied to claims 16, 17, 18, 19, 20, 22, 26, 27, and 29 above, and further in view of Aladjov (US 5,788,943).

Ohzuku is applied and incorporated herein for the reason above.

Regarding claim 21 and 28, Ohzuku does not expressly teach that the first and second mixtures are exposed to ultrasonic energy. However, Aladjov teaches a method for making an

electrode material for a battery where controlling the application of ultrasonic energy to a reactor used to form the electrode particles facilitate the production of particles in a wide range of proportions (sizes) (Title; 5:32-51). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to expose the first and second mixtures used in the method of Ohzuku because Aladjov teaches that the application of ultrasonic energy can assist in controlling the size and crystal structure of the particles formed (see Aladjov, 5:32-51).

13. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. (US 2003/0170540) as applied to claims 16-22 and 26-29 above, and further in view of Tanigawa et al. (US 2002/0164527).

Ohzuku is applied and incorporated herein for the reason above.

Regarding claim 23, Ohzuku teaches the concentration for the aqueous ammonia solution is 4.8 mol/liter, the concentration of the aqueous nickel sulfate is 1.2 mol/liter, the concentration of the aqueous manganese sulfate is 1.2 mol/liter, and the concentration of the aqueous cobalt sulfate is 1.2 mol/liter (para. 211).

Ohzuku does not expressly teach that the concentration of the aqueous ammonia solution is between 0.2 and 0.3 of the aqueous metal solution.

Tanigawa teaches a process for making a positive electrode active material with precipitation of a nickel hydroxide powder from an aqueous solution containing nickel ion and at least an ion of Co or Mn, and that it is possible to manipulate the composition, particle circularity, particle size, specific surface area and crystallinity of the obtained active material by managing and controlling the concentration, pH, and retention time of the aqueous solution in the reaction vessel (para. 58-61).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary concentration of the aqueous solution in the reaction vessel, because Tanigawa et al. teaches that by managing and controlling the concentration of the aqueous solution in the reaction vessel it is possible to manipulate the composition, particle circularity, particle size, specific surface are and crystallinity of the obtained active material (see Tanigawa, para. 58-61). Discovery of optimum value of result effective variable in known process is ordinarily within skill of art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

The remaining limitations recited in this claim have been addressed above with respect to claim 22.

Regarding claim 24, Ohzuku teaches 4.8 mol/liter of aqueous NaOH ("basic solution") being added to the apparatus ("reactor") (para. 211).

Ohzuku does not expressly teach the aqueous NaOH (Applicant's basic solution) being added to make a pH of 11.0 to 11.5.

However, Tanigawa also teaches a process for making a positive electrode active material with precipitation of a nickel hydroxide powder from an aqueous solution containing nickel ion and at least an ion of Co or Mn, and that it is possible to manipulate the composition, particle circularity, particle size, specific surface are and crystallinity of the obtained active material by managing and controlling the concentration, pH, and retention time of the aqueous solution in the reaction vessel (para. 58-61).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the pH of the aqueous solution in the reaction vessel, because Tanigawa teaches that by managing and controlling the pH of the aqueous solution in the reaction vessel it is possible to manipulate the composition, particle circularity, particle size, specific surface are and crystallinity of the obtained active material (see Tanigawa, para. 58-61). Discovery of optimum

value of result effective variable in known process is ordinarily within skill of art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

14. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohzuku et al. (US 2003/0170540) as applied to claims 16-24 and 26-29 above, and further in view of Sun et al. (US 6,071,489).

Ohzuku is applied and incorporated herein for the reason above.

Regarding claim 25, Ohzuku teaches mixing and reacting the nickel manganese cobalt composite hydroxide with lithium hydroxide ("lithium precursor") to obtain $\text{LiNi}_{1/3}\text{Mn}_{1/3}\text{Co}_{1/3}\text{O}_2$ ("lithium metal composite oxide") (para. 211,212).

Ohzuku does not expressly teach a chelating agent being used in the step of obtaining the lithium metal composite oxide. However, Sun teaches glycolic acid being used as a chelating agent in the step of preparing the lithium cathode active material, so that a pure phase of lithium cathode active material powder is prepared (12:29-35). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize glycolic acid as a chelating agent in the step of forming the lithium positive electrode active material, which is the lithium metal composite oxide, because Sun et al. teaches glycolic acid being used as a chelating agent in the step of preparing the lithium cathode active material, so that a pure phase of lithium cathode active material powder is prepared (see Sun, 12:29-35).

Response to Arguments

15. Applicant's arguments filed August 25, 2010 have been fully considered, but applicant has amended the claims such that new grounds of rejection were necessitated.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Edu E. Enin-Okut** whose telephone number is **571-270-3075**. The examiner can normally be reached on Monday to Thursday, 7 a.m. - 3 p.m. (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Edu E. Enin-Okut/
Examiner, Art Unit 1727

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1727